his own endeavors acquired considerable skill at painting, secured a position as a calico engraver at Lowell. Here he married Miss Maria Pease, and last year they celebrated the sixtieth anniversary of their wedding. From 1826 to 1835 he was employed at the Merrimac works at Lowell, designing patterns, a part of that time being employed at other establishments of a similar character.

During all that period he kept up his practice as a painter, he being an enthusiast in that direction. In 1835 he discontinued his business as a calico designer and engraver, and moved to Boston and established a studio on Tremont Street, selecting Cambridge as a place of residence, his home being on Prospect Street. His pictures of the late Dr. Hare of Philadelphia and that of Dr. Hill of Cambridge are specimens of his skill and taste. At the house on Brookline Street there are a number of specimens of his art, among which are the faces of Daniel Webster, Constable Clapp, renowned in his day as a skilful detector of crimes, and of a son who died when a youth, painted from memory. During this time sons and daughters were born to him, George B. in 1827 and Alvan G. in 1832, both of whom are living.

He began with his sons in 1846 the manufacture of telescopes. The younger son, Alvan G., at first entered into other business, but finally settled down to that of telescope making, and all three, under the name and style of Clark & Sons, have worked together for nearly forty years.

In 1850 Mr. Alvan Clark went to Europe and spent a great deal of his time with Mr. W. R. Dawes, the English astronomer, and while in his observatory discovered a new star, now known as companion to '99 Hercules.' Mr. Clark afterward had an extensive correspondence with Mr. Dawes, and spoke of his connection with him as the closest friendship of his life. Soon after his return from Europe in 1860 he received the first order for a large telescope in this country from the University of Mississippi, the glass being 18½ inches, three inches larger than any that had been hitherto successfully used in the world. The war prevented its sale to the southern college, and it was finally purchased by the University of Chicago. Then followed the construction of two glasses of twenty-six inches each, one being disposed of to the University of Virginia and the other placed in the observatory at Washington. Their reputation rapidly spread through Europe, and orders came faster than they could be filled. The number of instruments they have made is very large. The cheapest one cost $300, while the national telescope was sold for $46,000, and the cost of the Lick glass was set at $50,000 without the mounting.

This was the work of a man who never had seen a lens in process of construction in the hands of any one out of his own shop. Mr. Clark was emphatically a self-made man. His only education was what he received in the public schools of western Massachusetts. His reputation was patiently, steadily, and justly earned, His extraordinary power seemed to be acuteness of the eye, of the touch, and of the understanding, combined with unlimited patience. Not long since he said: "I owe largely my recognition by the scientific world to Mr. Dawes. I had, as I thought, with one of my telescopes discovered several new double stars. I wrote to Dawes, asking him to verify my observations. He answered that they were real discoveries. I reported other discoveries. Mr. Dawes wrote: 'Where did you get your telescope?' 'I made it,' was my reply. I sold him that glass and five others."

PROCEEDINGS OF THE AMERICAN ASSOCIATION.

Section C.

THE address of Vice-President Prescott was on the chemistry of nitrogen as disclosed in the constitution of the alkaloids. He said, "The character of nitrogen is a challenge to chemical skill. Mocking us by its abundance in its free state, the compounds of this element are so sparingly obtained that they set the rate of value in supplies for the nourishment of life, — the agent chosen and trusted for projectile force in arts of war and of peace, — yet the manufacture of its most simple and stable compound has been a vain attempt, and it is one urged anew by the chemical industries. Moreover, nitrogen holds the structure of the aniline dyes, and governs the constitution of the vegetable alkaloids. In research the nearest approaches to the molecule as a chemical centre have been reached through organic chemistry. Carbon was the first and hydrogen has been the second element to give to organic chemistry a definition. At present, carbon is looked upon as the member for fixed position, and hydrogen as the member for exchange, in organic families. Nitrogen comes next in turn to receive attention. The study of the carbonaceous compounds of nitrogen promises to do for organic chemistry what the latter has done for general science."

The speaker then outlined the history and present state of the structural chemistry of the vegetable alkaloids, as follows: "1. Nitrogenous bases as derivatives of ammonia. 2. Nitrogenous bases represented by aniline. 3. The pyridine type in the vegetable alkaloids. The constitution of the pyridine and quinoline series was ascertained by Koerner and by Baeyer in 1870. These bodies can be obtained from bone-oil and from coal-tar. They are of a remarkable chemical structure. Like aniline, they have the closed chain of six positions, but, unlike aniline, they have one of these positions held by nitrogen. The introduction of the atom of nitrogen into the closed ring so affects the qualities of the molecule that stable addition-products are formed. About 1879 it began to appear that the vegetable alkaloids in general are of the pyridine type, of 'aromatic' composition. In this type the structure of ammonia is not violated; and the theories of Liebig, Wurtz, and Hofmann are not superseded. Within the last three or four years the veil has been drawn from the structure of the chief alkaloids of plants. Even before that, the alkaloids of black pepper, tobacco, and hemlock, of very simple composition, were studied with success. The alkaloids of the belladonna-root, the cinchona-bark, and the coca-leaf, are now subject to an increasing measure of constructive operation in the laboratory. Morphine is convertible into codeine, and the efforts to convert strychnine into brucine, and cinchonine into quinine, ought to succeed. The necessary studies of position in the pyridine molecule are being entered upon. Some good medicinal alkaloids are being made by art. It may come that the identical alkaloids of nature will be made by art. Not by chance efforts, however, nor by premature short-cuts, but, if at all, through the well-earned progress of the world's chemistry, will these results be gained. And it speaks enough for the rate of this progress to say that one of the very first of the forward steps here recounted was taken by a man still living as a contributor. Due honor for what his hands have done, and all gratitude for what his eyes have seen."

Thirty-five papers and two committee reports were presented to the section. The papers may be classified as follows: — *Analytical Chemistry*, on a new apparatus for fractional distillation, by T. H. Norton; on the improvement in stand for electrolysis, by W. H. Herrick; on a process for separation of alkaloidal poisons, by Arthur L. Greene; on the determination of nitrogen by soda-lime, by W. O. Atwater; on indirect determination of calcium, by W. H. Herrick; on a new method for the preparation of anhydrous aluminum chloride, by C. F. Mabery. *Plant Chemistry* (agricultural and pharmaceutical), on the composition of wild-cherry bark, by F. B. Power and Henry Weimar; on the chemical composition of the juices of sorghum-cane in relation to the production of sugar, by H. W. Wiley; note on the chemistry of germination, and on the absorption of nitrogenous nutriment by the roots of plants, by William McMurtrie; on a compound rich in carbon occurring in some plants, by Helen C. DeS. Abbott. *Organic Chemistry*, on the fatty acids of drying oils, by L. M. Norton; on some higher homologues of cocaine, by F. G. Novy; on the salts of benzene-sulphonic acid with the amines, on some new metallic salts of benzene-sulphonic acid, on the amine salts of para-toluene-sulphonic acid, on the action of silicon fluoride on acetone, on the limits of the direct bromination of acetone and on the action between ammonium sulphocyanide and monobrom-acetone, on the action of chlorine on acenaphthene, on the urates of ammonium and the amines of the fatty acids, and on some new nitro-prussides, by T. H. Norton; on the action of aromatic amines upon certain substituted unsaturated acids, and on the constitution of the sulphur compounds in crude petroleum oils, by C. F. Mabery. *Mineral Chemistry*, on the composition of Lockport Sandstone, by H. W. Weld; on the processes of soil-formation from the north-western basalts, by E. W. Hilgard; on the occurrence in nature of a copper antimonide, and on certain alloys of calcium and zinc, by T. H. Norton; analyses of two manganese minerals, by F. C. Novy. *Theoretical Chemistry*,

on the significance of 'bonds' in structural formulas, by Spencer B. Newberry; on positive and negative units of valence, by Albert B. Prescott. *Physiological Chemistry*, on the percentage of ash in human bones of different ages, by W. P. Mason; on chemical changes accompanying osmose in living organisms as illustrated by the oyster, by W. O. Atwater; on the delicacy of the sense of taste, by E. H. S. Bailey and E. L. Nichols; on the scientific basis of feeding infants, by A. R. Leeds. *Medical Chemistry*, on the causes, progress, and cure of a recent great outburst of typhoid-fever at Mount Holly, N.J., by Albert R. Leeds. *Committee Reports*, on methods of stating water-analysis, by G. C. Caldwell; on indexing chemical literature, by H. C. Bolton.

Prof. L. M. Norton, in his experiments in drying oils, has detected the presence of several fatty acids, which are not mentioned in the books. Especially is this the case with cottonseed-oil, which contains several acids in addition to oleic. Owing to easy oxidation, it is difficult to separate these acids. The method of distillation in a vacuum was found most effective. Prof. T. H. Norton's papers on organic chemistry disclosed numerous lines of original investigation undertaken in connection with advanced students, and emphasized the growing importance of mingling original researches with instruction, which is now practised so successfully by the leading laboratories of the world. The papers on analytical chemistry contained nothing of general scientific interest. The alloys of copper and antimony and of calcium and zinc presented by Professor Norton disclosed many important facts. He found it impossible by any known method to obtain an alloy of zinc and calcium containing more than five or six per cent of the latter metal. The properties of the compound are also profoundly affected by the proportion of calcium present.

Dr. Wiley presented, in the paper on sorghum, the means of all the recorded analyses of sorghum-juices. The important fact is brought to light that this average juice is unfit for sugar-making, containing at the rate of a little over twenty pounds of available sugar to the ton of cane. In many instances, however, the percentage of sucrose in the juice is remarkably high. The successful solution of the problem of sugar-making from sorghum depends on the production of a uniform grade of sorghum reasonably rich in sucrose. This should be the work of the agricultural experiment-stations.

The sense of taste, as shown by the experiments of Professors Bailey and Nichols, is in general more delicate in females than in males. Bitter is detected in far greater dilutions than sweet or saline tastes.

This session of Section C was remarkable in being almost free from papers of a 'cranky' nature. No lurid schemes for the regeneration of the human race by chemical affinity were presented, and no intensely improbable properties of matter were described. While many of the papers were crude and some of them quite elementary, it is nevertheless true that the Chemical Section is progressing in numbers and influence and the character of its work.

Section I.

THE Section of Economic Science and Statistics this year exercised its usual latitude in the consideration of a great variety of subjects; but, under the close scrutiny of its sectional committee and the rulings of its chairman, everything objectionable was excluded and a high standard maintained. Thus, while all the subjects presented were treated in a scientific manner, the proceedings were so conducted as to meet with popular favor. Although inconveniently located on the upper floor of Hamilton Hall, so that those unacquainted with the ways of the association had difficulty in finding the place, the sessions of this section opened with a room nearly full, on Thursday, and the attendance daily increased until the closing session on Tuesday (Aug. 23), when the hall was uncomfortably crowded by the largest audience present at any sectional meeting during the week.

'The Food-Question' was, by special arrangement, made the sole topic for Thursday. The sessions, both forenoon and afternoon, were opened by Prof. W. O. Atwater of Connecticut, who treated the subject much after the style of his articles in current issues of *The Century Magazine*. He was enabled to add much interest by a fine collection of illustrative material, some of the charts being his own, but the rest prepared at the Massachusetts Institute of Technology, and loaned for this occasion by The Industrial Education Association of No. 9 University Place in this city, through the kindness of Miss H. R. Burns. Much interest was manifested at both sessions, and the discussion took a wide range, including the economy of food in its physiological and pecuniary aspects, the food of workingmen in its relation to work done, and the preparation of food, together with the 'cooking-schools' and their results. The most prominent participants in the discussions of the day were Prof. W. H. Brewer of New Haven, E. J. James of Philadelphia, S. A. Lattimore of Rochester, J. M. Ordway of New Orleans, Dr. D. E. Salmon of Washington, Mrs. Richards and Mrs. Lincoln of Boston, and R. T. Colburn of this city.

On Friday the section gave its attention to statistical and financial questions. The leading paper was by Prof. Edmund J. James of the University of Pennsylvania, and was mainly a sharp and well-presented criticism of the recent essays of Mr. Edward Atkinson upon the growth and rapidly increasing wealth of this country. Dr. James showed grave omissions in Mr. Atkinson's figures, which greatly modified the deductions from them, and, by marshalling the same statistics in a different form, reached very different conclusions, both as to the country's accumulating wealth as a whole, and the earnings of laborers. Charles S. Hill of Washington followed with a statistical paper somewhat similar in character. Then E. B. Elliott, actuary of the Treasury Department, continued his last year's exhibit of the rates of interest realized by investors in the bonded securities of the United States. He showed, that, based upon the market-prices of the government 4 and 4½ per cent bonds, the actual interest during the past year has never exceeded 2½ per cent, and at times it has fallen below 2 per cent. He predicted a net rate for some time to come, closely approximating 2 per cent.

As with the other sections, business was suspended from Friday noon till Monday morning, by the various excursions, — an interruption emphatically disapproved by many active members.

The morning session of Monday took a rather philosophic turn, although the title of the paper which gave rise to most discussion made a claim to belonging within the realm of science: it was 'The Science of Civics,' by Dr. Henry Randall Waite, and while covering broader ground, served especially as an argument and justification for the American Institute of Civics, of which Dr. Waite is president, and its work. An animated discussion ensued, dealing with ethics, politics (in its best sense), and economics, and their relations to one another. Monday afternoon, Section I joined with that of Mechanical Science in considering the question of Isthmian transit. This subject in its various bearings was clearly presented by Commodore Taylor, Surgeon Bransford, and Engineer Peary, of the United States Navy, and Mr. J. W. Miller of this city; and the interested audience seemed well convinced of the superiority of the ship-canal and the Nicaragua route over all other schemes, and the certainty of the early completion of this enterprise by American capital, and to be under the control of the United States.

Manual training, its methods and results, in public schools and special institutions, from economical, industrial, and educational aspects, formed the principal subject of the final session of the section on Tuesday. Prof. Calvin M. Woodward of St. Louis, and Prof. James of Philadelphia, read papers, and a general discussion followed entirely favorable to manual training in every form.

Yan Phou Lee of New Haven closed the session with an eloquent address upon the Chinese question from a Chinese standpoint, delivered before as large and enthusiastic an audience as any assembled at Columbia College during the meeting of the association. It was a telling arraignment of the policy and conduct of the United States in reference to the Chinese, and reminded one of an epitome of Helen Hunt Jackson's 'Century of Dishonor.'

HEALTH MATTERS.

Cure of Consumption.

AMONG the first to use Bergeon's treatment for the cure of consumption by gaeous enemata in this country, and certainly the first in Philadelphia, was Dr. E. T. Bruen. As a result of the treatment